DOUBLE POLE MEMBRANE SWITCH HAVING PREFERRED SEQUENCE CLOSING FEATURE

FIELD OF THE INVENTION

This invention relates to membrane switches of the type in which two contacts on one surface are engaged with one contact on a second surface when the switch is closed. The invention is particularly concerned with the sequence in which the switch contacts are engaged with each other when the switch is closed.

BACKGROUND OF THE INVENTION

A widely used type of membrane switch serves to connect two circuit conductors on one surface to one surface conductor on a second surface. A switch of this type is of the double pole single throw type in that when one of the membranes is pressed towards the other membrane, one conductor is connected to two conductors on the other membrane.

In known types of membrane switches of the double pole single throw type, the two switch contacts on the one surface will engage or contact the one switch contact on the second surface substantially simultaneously in most instances when the switch is closed. However, it is always possible that one of the contacts on the first surface will engage or contact the single contact on the second surface before the second contact on the first surface is brought into engagement with the single contact on the second surface. Sequential closing of this type can occur, for example, when the person operating the device on which the switch is provided presses the switch site with a pointed instrument such as a pencil point so that the closing force is applied only to a localized area. Most membrane switches are designed to be closed by finger pressure, and if finger pressure is applied, the closing force is distributed over a relative extensive area rather than concentrated in a very limited area.

In many electronic devices, it is of no consequence if the contacts of a double pole single throw switch do not engage or contact each other at the same instant. However, it is important in some devices that certain sequences of closing be avoided if the device is to function in its intended manner. If the two contacts only of a double pole single throw switch are engaged with each other in some electronic devices, a totally unacceptacle result will follow and the operator may conclude that there is a malfunction in the device. The probability of improper closing sequence in a given switch may be very slight, but it is nonetheless important that the switch be designed to exclude improper closing sequence entirely.

The present invention is directed to the achievement of a double pole single throw membrane switch which, when closed, will positively exclude the possibility of one of the contacts being connected to a second one of the contacts before it is connected to the third contact. Stated another way, the invention is directed to the achievement of a membrane switch in which a preferred contact closing sequence will be followed or all of the contacts will be pressed into engagement with each other simultaneously.

A membrane switch device in accordance with the invention comprises first and second parallel spaced-apart insulating supports which have opposed first and second surfaces and have opposed contact means on the opposed surfaces forming an electrical switch. At least one of the supports is flexible so that the supports can be moved relatively towards and against each other until the opposed contacts are against each other. A switch in accordance with the invention is particularly characterized in that the contact means on the first surface comprises two electrically separate and adjacent contacts, one of the contacts having a first surface main contact portion and a commoning portion. The other contact on the first surface has a commoning portion which is adjacent to the commoning portion of the main contact portion. The two commoning portions define a commoning zone on the first surface. The contact means on the second surface comprises a second surface main contact portion and a second surface commoning portion which is electrically isolated from the second surface main contact portion. The second surface commoning portion is located such that it is against the commoning zone on the first surface when the second surface is moved relatively against the first surface. The second surface main contact portion is against the first surface main contact portion when the surfaces are against each other. A second surface circuit conductor on the second surface extends to the second surface main contact portion and first surface circuit conductors on the first surface extend to the two contacts on the first surface. Upon relative movement of the second surface towards the first surface the second surface circuit conductor will be electrically connected to both circuit conductors on the first surface and the sequence of connection will exlude the possibility of the second surface circuit conductor being connected to the other contact on the first surface prior to its being connected to the first surface main contact portion.

In accordance with further embodiments, the contact means on the first surface comprises a first surface central contact and a peripheral contact which surrounds the central contact. The commoning portions comprise commoning extensions which extend towards each other.

In accordance with further embodiments, the first surface peripheral contact, the commoning zone, and the second surface commoning portion are substantially circular.

DESCRIPTION OF THE DRAWINGS

FIG. **1** is a fragmentary view of a portion of a panel containing an individual switch in accordance with the invention.

FIG. **2** is a view similar to FIG. **1** but showing the parts of the switch exploded from each other.

FIG. **3** is a plan view of one of the insulating supports of the switch and showing the two switch contacts on the support.

FIG. **4** is a plan view of the surface of the other support showing the switch contacts on the other support.

FIG. **5** is a plan view showing the relationship of the switch contacts of FIGS. **3** and **4** to each other when the switch is closed.

As shown in FIGS. **1** and **2**, a switch assembly **2** in accordance with the invention comprises a base member **4**, a first insulating support **6** having contact means **22** thereon, a separator **8**, a second insulating support **10** having contact means **24** thereon and a cover **12**. The cover is somewhat flexible and has the switch site indicated at **14** by a numeral or other marking. The support **6** has an upper surface **16** which is opposed to the lower surface **18** of the upper support **10**. The separator **8** has